

IN THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) Apparatus for connecting at least a first Fibre Channel device that is capable of operating at a first physical link rate to at least a second Fibre Channel device that is capable of operating at a second physical link rate that is higher than said first physical link rate, the apparatus comprising:

a first port to which the at least a first Fibre Channel device operating at a first physical link rate can be connected;

a second port to which the at least a second Fibre Channel device operating at a second physical link rate can be connected;

a first buffer for storing data received at the first port from a said first Fibre Channel device and forwarding said data to the second port for transmission to a said second Fibre Channel device when a said first Fibre Channel device wishes to send said data to a said second Fibre Channel device;

a second buffer for storing data received at the second port from a said second Fibre Channel device and forwarding said data to the first port for transmission to a said first Fibre Channel device when a said second Fibre Channel device wishes to send said data to a said first Fibre Channel device;

a first bypass buffer for storing data received at the first port from a said first Fibre Channel device and causing said data to be returned to the first port when a said first Fibre Channel device wishes to send said data to another Fibre Channel device connected to the first port; and,

a second bypass buffer for storing data received at the second port from a said second Fibre Channel device and causing said data to be returned to the second port when a said second Fibre Channel device wishes to send said data to another Fibre Channel device connected to the second port;

whereby a said second Fibre Channel device can operate at said second physical link rate which is higher than said first physical link rate of a said first Fibre Channel device regardless of whether or not a said first Fibre Channel device is sending data words to a said

second Fibre Channel device and regardless of whether or not a said second Fibre Channel device is sending data words to a said first Fibre Channel device.

2. (Original) Apparatus according to claim 1, comprising a storage region for storing an Arbitrated Loop Physical Address (AL_PA) look-up table in which the Arbitrated Loop Physical Addresses (AL_PAs) of all devices connected to said first and second ports are saved.

3. (Currently Amended) Apparatus according to claim 2, wherein the first and second ports are arranged to recognise LISM (Loop Initialisation Select Master), LIFA (Loop Initialisation Fabric Assigned), LIPA (Loop Initialisation Previously Acquired), LIHA (Loop Initialisation Hard Assigned) and LISA (Loop Initialisation Soft Assigned) frames.

4. (Original) Apparatus according to claim 3, wherein the first and second ports are arranged to compare the AL_PA bit maps of LIFA, LIPA, LIHA and LISA frames received at the first and second ports in order to identify which AL_PAs have been assigned to devices connected to the first and second ports and to pass a result of said comparison to the storage region so that the AL_PAs of all devices connected to said first and second ports can be saved in the AL_PA look-up table.

5. (Previously Presented) Apparatus according to claim 1, wherein the first and second ports are arranged to send at least some Fill words received at the first port to the second port and to send at least some Fill words received at the second port to the first port, regardless of whether or not a said second Fibre Channel device is sending data words to a said first Fibre Channel device and regardless of whether or not a said first Fibre Channel device is sending data words to a said second Fibre Channel device.

6. (Currently Amended) Apparatus according to claim 1, wherein the first and second ports are arranged to send at least some ARB (Arbitrate Primitive Signal) words received at the first port to the second port and to send at least some ARB words received at the second port to the first port, regardless of whether or not a said second Fibre Channel device is sending data words to a said first Fibre Channel device and regardless of whether or not a said first Fibre Channel device is sending data words to a said second Fibre Channel device.

7. (Previously Presented) Apparatus according to claim 1, wherein the first and second ports and the first and second bypass buffers are arranged such that, when non-identical ARB words are received at the first and second ports, arbitration between said non-identical ARB words is carried out and the winning ARB word of the arbitration process is returned to the port at which it was received.

8. (Previously Presented) Apparatus according to claim 1, wherein the first and second ports are arranged such that at least some Primitive Sequences received at the first port are sent to the second port and such that at least some Primitive Sequences received at the second port are sent to the first port, regardless of whether or not a said second Fibre Channel device is sending data words to a said first Fibre Channel device and regardless of whether or not a said first Fibre Channel device is sending data words to a said second Fibre Channel device.

9. (Previously Presented) Apparatus according to claim 1, wherein the first buffer is arranged such that, when a said first Fibre Channel device wishes to send data words to a said second Fibre Channel device, frame data and Start of Frame and End of Frame delimiter words received at the first port from a said first Fibre Channel device are only forwarded by the first buffer to the second port when a predetermined amount of frame data has been stored in the first buffer.

10. (Previously Presented) Apparatus according to claim 1, wherein the second buffer is arranged such that, when a said second Fibre Channel device wishes to send data words to a said first Fibre Channel device, frame data and Start of Frame and End of Frame delimiter words received at the second port from a said second Fibre Channel device are only forwarded by the second buffer to the first port when a predetermined amount of frame data has been stored in the second buffer.

11. (Previously Presented) Apparatus according to claim 1, wherein the first and second bypass buffers are arranged such that, when a said first Fibre Channel device wishes to send data words to another Fibre Channel device connected to the first port, frame data and Start of Frame and End of Frame delimiter words received at the first port from a said first Fibre Channel device are returned to the first port, and such that when a said second Fibre Channel

device wishes to send data words to another Fibre Channel device connected to the second port, frame data and Start of Frame and End of Frame delimiter words received at the second port from a said second Fibre Channel device are returned to the second port.

12. (Previously Presented) Apparatus according to claim 1, wherein the second port is arranged such that, when a said second Fibre Channel device wishes to send data words to a said first Fibre Channel device, the exact number of Non-Fill words received at the second port are forwarded to the first port.

13. (Currently Amended) Apparatus according to claim 12, wherein the arrangement is such that if the second buffer is approaching a full state, R_RDY (Receiver Ready) words received at the first port are not transmitted to the second port until the second buffer has emptied sufficiently to receive more frames from a said second Fibre Channel device.

14. (Previously Presented) Apparatus according to claim 1, wherein the first port is arranged such that, when a said first Fibre Channel device wishes to send data words to a said second Fibre Channel device, the exact number of Non-Fill words received at the first port are forwarded to the second port.

15. (Previously Presented) Apparatus according to claim 1, wherein the first and second bypass buffers are arranged such that, when a said first Fibre Channel device wishes to send data words to another Fibre Channel device connected to the first port, Non-Fill words received at the first port from a said first Fibre Channel device are returned to the first port, and such that, when a said second Fibre Channel device wishes to send data words to another Fibre Channel device connected to the second port, Non-Fill words received at the second port from a said second Fibre Channel device are returned to the second port.

16. (Original) A method of operating apparatus that connects at least a first Fibre Channel device that is capable of operating at a first physical link rate to at least a second Fibre Channel device that is capable of operating at a second physical link rate that is higher than said first physical link rate, the apparatus having a first port to which the first Fibre Channel device capable of operating at the first physical link rate is connected, a second port to which the second Fibre Channel device capable of operating at the second physical link rate is

connected, a first buffer, a second buffer, a first bypass buffer and a second bypass buffer, the method comprising:

when the first Fibre Channel device wishes to send data to the second Fibre Channel devices, storing said data received at the first port from the first Fibre Channel device in the first buffer, forwarding said data to the second port and transmitting said data from the second port to the second Fibre Channel device;

when the second Fibre Channel device wishes to send data to the first Fibre Channel device, storing said data received at the second port from the second Fibre Channel device in the second buffer, forwarding said data to the first port and transmitting said data from the first port to the first Fibre Channel device;

when the first Fibre Channel device wishes to send data to another Fibre Channel device connected to the first port, storing said data received at the first port from the first Fibre Channel device in the first bypass buffer and causing said data to be returned to the first port; and,

when the second Fibre Channel device wishes to send data to another first Fibre Channel device connected to the second port, storing said data received at the second port from the second Fibre Channel device in the second bypass buffer and causing said data to be returned to the second port;

whereby the second Fibre Channel device operates at the second physical link rate which is higher than the first physical link rate of the first Fibre Channel device regardless of whether or not the first Fibre Channel device is sending data words to the second Fibre Channel device and regardless of whether or not the second Fibre Channel device is sending data words to the first Fibre Channel device.

17. (Original) A method according to claim 16, comprising saving the Arbitrated Loop Physical Addresses (AL_PAs) of all devices connected to said first and second ports in an Arbitrated Loop Physical Address (AL_PA) look-up table.

18. (Original) A method according to claim 17, wherein the first and second ports recognise LISM, LIFA, LIPA, LIHA and LISA frames.

19. (Original) A method according to claim 18, wherein the first and second ports compare the AL_PA bit maps of LIFA, LIPA, LIHA and LISA frames received at the first

and second ports in order to identify which AL_PAs have been assigned to devices connected to the first and second ports and pass a result of said comparison to the look-up table so that the AL_PAs of all devices connected to said first and second ports are saved in the AL_PA look-up table.

20. (Previously Presented) A method according to claim 16, wherein the first and second ports send at least some Fill words received at the first port to the second port and send at least some Fill words received at the second port to the first port, regardless of whether or not the second Fibre Channel device is sending data words to the first Fibre Channel device and regardless of whether or not the first Fibre Channel device is sending data words to the second Fibre Channel device.

21. (Previously Presented) A method according to claim 16, wherein the first and second ports send at least some ARB words received at the first port to the second port and send at least some ARB words received at the second port to the first port, regardless of whether or not the second Fibre Channel device is sending data words to the first Fibre Channel device and regardless of whether or not the first Fibre Channel device is sending data words to the second Fibre Channel device.

22. (Previously Presented) A method according to claim 16, wherein when non-identical ARB words are received at the first and second ports, arbitration between said non-identical ARB words is carried out and the winning ARB word of the arbitration process is returned to the port at which it was received.

23. (Previously Presented) A method according to claim 16, wherein at least some Primitive Sequences received at the first port are sent to the second port and at least some Primitive Sequences received at the second port are sent to the first port, regardless of whether or not the second Fibre Channel device is sending data words to the first Fibre Channel device and regardless of whether or not the first Fibre Channel device is sending data words to the second Fibre Channel device.

24. (Previously Presented) A method according to claim 16, wherein when the first Fibre Channel device wishes to send data words to the second Fibre Channel device, frame data

and Start of Frame and End of Frame delimiter words received at the first port from the first Fibre Channel device are only forwarded by the first buffer to the second port when a predetermined amount of frame data has been stored in the first buffer.

25. (Previously Presented) A method according to claim 16, wherein when the second Fibre Channel device wishes to send data words to the first Fibre Channel device, frame data and Start of Frame and End of Frame delimiter words received at the second port from the second Fibre Channel device are only forwarded by the second buffer to the first port when a predetermined amount of frame data has been stored in the second buffer.

26. (Previously Presented) A method according to claim 16, wherein when the first Fibre Channel device wishes to send data words to another Fibre Channel device connected to the first port, frame data and Start of Frame and End of Frame delimiter words received at the first port from the first Fibre Channel device are returned to the first port, and when the second Fibre Channel device wishes to send data words to another Fibre Channel device connected to the second port, frame data and Start of Frame and End of Frame delimiter words received at the second port from the second Fibre Channel device are returned to the second port.

27. (Previously Presented) A method according to claim 16, wherein when the second Fibre Channel devices wishes to send data words to the first Fibre Channel device, the exact number of Non-Fill words received at the second port are forwarded to the first port.

28. (Original) A method according to claim 27, wherein if the second buffer is approaching a full state, R_RDY words received at the first port are not transmitted to the second port until the second buffer has emptied sufficiently to receive more frames from the second Fibre Channel device.

29. (Previously Presented) A method according to claim 16, wherein when the first Fibre Channel devices wishes to send data words to the second Fibre Channel device, the exact number of Non-Fill words received at the first port are forwarded to the second port.

30. (Previously Presented) A method according to claim 16, wherein when the first Fibre Channel device wishes to send data words to another Fibre Channel device connected to the first port, Non-Fill words received at the first port from the first Fibre Channel device are returned to the first port, and, when the second Fibre Channel device wishes to send data words to another Fibre Channel device connected to the second port, Non-Fill words received at the second port from the second Fibre Channel device are returned to the second port.